

crevices of the limestone cliffs which encompass the summit, as also on the steep slopes, which were, besides, covered with *Asphodelus ramosus*, L., the before-mentioned *Iberis* and *Anthyllis*. Here too occurred, although but very few specimens, in the region of the Saxifrages, a pretty *Tulipa*, which appears to be new, since it differs from *T. Celsiana*, which it resembles in the colour of its flower, by "*foliis reflexis, flore nutante (nec erecto) et perigonii segmentis lanceolatis (nec oblongo-lanceolatis)*," setting aside the difference of habitat, since *T. Celsiana* only presents itself in the warm region. Lastly, on the highest rocks of Sta Maria flourish *Muscari botryoides*, and especially *Armeria alliacea*, W., in great abundance.

The very small number of Cryptogamia, even in the mountain and alpine regions, is striking. The bark even of the older trees is generally quite bare, or at the most covered with a layer of *Parmelia parietina*; the rocks also are for the greater part devoid of all Lichens. In the springs a *Chara* is found, yet no Algæ, and of mosses and ferns, very few occur in the upper mountain and alpine region. Of ferns I have observed, on the rocks of Sta Maria, only *Ceterach officinarum*, *Asplenium Trichomanes* and *A. fontanum*; of mosses, besides some barren *Hypna*, only an *Encalypta* and *Frullania hispanica*, N. ab Es.; the latter indeed, like the liverworts of our mountains, in thick tufts. The cryptogamic flora is said to be more considerable in winter.

BIBLIOGRAPHICAL NOTICES.

Die Kieselschaligen Bacillarien oder Diatomeen. Von Dr. F. T. Kützing: Nordhausen, 1844. Tab. 30. p. 152.

THE beauty and correctness of the plates in the 'Phycologia Generalis,' which we have already reviewed in our Journal, has excited the admiration of all who have noticed or consulted the work. Those of the present are equally deserving of praise, and maintain the reputation of the author as an excellent draughtsman and accurate observer. A certain proportion of the figures are professedly copies, but wherever the author has been able to prepare the illustrations himself he has not failed to do so, and the instances to the contrary are not so numerous as to detract from the originality of the work. Dr. Kützing, to whose kindness we are indebted for our copy, has profited by all the materials which came within his notice, and if we mistake not also by the criticisms to which his former work was subjected, not indeed as regards the illustrations but in respect of its plan, and especially of his notions of genera and species. In the present instance the species are all defined, the principal synonyms noticed, and some details given under each generic head, in all which points the 'Phycologia' was very deficient. It is we understand his intention to publish the *Desmidiaceæ* in a similar form, and we do not doubt that we shall find the same progressive improvement which we so gladly hail in the present instance. He will we know be most grateful to those who have studied this curious and

interesting group for the communication of any new or rare British species. We are also rejoiced to hear that he contemplates preparing a 'Phycologia Germanica,' a work which cannot fail to prove most instructive.

The points of interest which are presented by the minute objects, of which so many species are here illustrated, are surpassed perhaps in scarcely any order of created beings, and the results which have arisen from their study, which is but yet in its infancy, are as important as unexpected. Not only is the question of their nature and affinity a very interesting one, and the variety and beauty of form most striking, but the study of these organized atoms bids fair to afford the geologist quite a new resource in his investigation of the comparative age or identity of strata. They exist in all climates, and in situations where neither other animals nor vegetables (to whichever class we assign these beings) can exist. Above 120 species were discovered by Dr. Hooker in very high latitudes, and by soundings far beyond the limits of ordinary vegetable or animal forms, and many of these when sent to Dr. Ehrenberg after a long voyage were all but alive. Whole strata are formed of their siliceous skeletons, and it seems that sometimes they are propagated to a certain extent in subterranean strata at the present day.

Authors have been much divided as to their nature, and while Dr. Ehrenberg doubts not they are animals, and believes that he has discovered within them a digestive apparatus and other organs such as exist in acknowledged infusoria, others, amongst the number of whom we must confess ourselves to be, as decidedly incline to consider them Algæ, and as constituting a most important link in the series. This question, like others relating to the group generally, is well discussed by Kützing, and we think it may be acceptable to our readers to offer them a translation of his remarks.

The following arguments are brought forward by Ehrenberg in favour of their being animals:—

1. They have, in part, a peculiar spontaneous motion which is effected by particular organs.

2. Many have a lateral opening, round which are seated globular bodies, which, like the cæca of Infusoria, become blue in an infusion of indigo in water, and must therefore be regarded as stomachs.

3. The shells of many *Diatomeæ* remind us by their structure and form of that of Gastropods and similar Mollusca.

As regards the first it may be remarked, that spontaneous motion also takes place in lower vegetable forms, which likewise is effected by peculiar ciliary organs. Witness the observations of Unger on the spores of *Vaucheria clavata*, and those of Flotow on *Hæmatococcus phivialis**. And I may here mention my own in the 'Phycologia Generalis' on *Ulothrix zonata* and other Algæ, which show that in all these lower forms appearances of motion are exhibited, which cannot be distinguished from those which take place in the Infusoria.

* To these may be added various observations of Thuret and Decaisne, not only in the lower Algæ, but in the acrospirms of Fuci.

The animal nature then of *Diatomeæ* is not proved by such spontaneous motion.

As regards the so-called stomachs, I have before proved, that their coloration by indigo is possibly a mere mechanical effect, and that the assertion therefore that they are really stomachs is unauthorized, and the more especially as these parts are so often wanting.

As to the third point, the shell has indeed in many cases a great similarity with that of Mollusca in form, structure and marking, but this is not constantly the case, and we find, in the higher families of plants, cells, which in marking, form and other points present similar appearances. Witness the various forms of pollen, in which the angles, spines, openings, &c. are not wanting. In this respect, then, the approximation of *Diatomeæ* to different vegetable forms is as great as to that of animals.

On the other hand, the following points speak for their vegetable nature :—

1. The great similarity of the compound forms to the Algæ and their origination by division.

There are indeed also compound Infusoria, for example compound monads and polypidoms ; but these are themselves questionable animals, and there is in them this great difference, that the individual animal extends itself freely beyond its cell, while the *Naviculæ* in *Encyonema*, *Schizonema* and *Micromega* and similar genera grow in the inner substance, and increase there as the cells of plants, and vegetate only as cells. And the individuals in *Fragilaria*, *Melosira*, *Himantidium*, &c. are as confined and unfit for the exhibition of animal motion.

2. The internal soft organic parts, which I have indicated as gonic substance, possess, as well in their chemical comportment as in their mode of development, peculiarities which are identical with those of the contents of the cells in conferva-like Algæ.

This is especially shown in the genus *Melosira* and its allied genera, which not only in the form but also in the chemical properties of their contents (through the presence of chlorophyll, which is indeed present in all *Diatomeæ*) perfectly agree with *Confervæ*.

3. The formation of seed or fruit takes place similarly in different Algæ, never in true animals.

4. The *Diatomeæ*, and especially the free motile *Naviculæ*, develop under the rays of the sun oxygen, like other decided plants.

The evolution of oxygen is indeed remarked also in green monads and *Euglena*, yet this proves nothing in favour of the animal nature of *Diatomeæ*, but makes the real nature of those beings very doubtful, and the more so as late observations show the origination of lower vegetables from monads and *Euglenæ*.

The weight of argument is we think certainly on the side of Dr. Kützing, whatever may be thought of particular points, and the whole seems to show, as Dr. Kützing had already distinctly stated in a separate pamphlet, and as indeed was indicated in the 'Gleanings of British Algæ' many years since, that there are beings in which vegetable and animal life are so intimately combined, that

according as the animal or vegetable element is predominant, they can at one time exhibit an animal, at another a vegetable life, without altering their originally received form.

In the genus *Micromega* the author has made some observations, which, if confirmed, are of very great importance, and more than any other point will tend to establish the true position of these beings in a natural system. He informs us that he has seen the naviculæ or frustules in this genus metamorphosed into green globular spores. An Alga was discovered by Dr. Dickie at Aberdeen, which was alluded to before in this Journal, which seems to confirm these views; but Mrs. Griffiths, than whom no one is able to form a better judgement, or whose opinion is entitled to greater weight, and Mr. Ralfs are inclined to think that the appearance is produced by parasites of the genus *Cocconeis* and similar productions. The point cannot therefore be received at present as established, though we ourselves are persuaded that Dr. Kützing's views will be found correct.

Our British coasts abound in species of *Schizonema* and *Micromega*, and we regret much that Dr. Kützing had not the command of better materials as regards the British species. We fear that some communicated by Binder were not authentically named, and this is the more to be regretted, as far the greater part of the species described in Harvey's 'Manual' are well understood by the author, and especially by Mrs. Griffiths, who has so largely contributed to the illustration of the genus. In this indeed our friend Dr. Kützing is not to be blamed, but the writer of the present remarks is rather inclined to reproach himself for not having, by some inadvertence, communicated specimens when it was in his power to do so. Our only reason for calling attention to the subject is to induce due caution in the examination of this part of the work.

We trust that it will receive the support it deserves, and we have little doubt that it will do so, as it is no less indispensable to the geologist than to the botanist.

The Botany of the Voyage of H.M.S. Sulphur. Edited by R. B. Hinds, Esq. The Botanical descriptions by G. Bentham, Esq. Nos. 2, 3, 4.

We have already noticed the first number of this valuable work, of which three additional numbers have recently reached us. The expectations which were raised by an examination of that number are fully answered by these. Indeed it seems to us that the plates have improved in the successive numbers. The description of the plants of California is concluded, and the remaining portion is occupied with those of Western Tropical America.

Several new genera are described and very many new species. It is quite unnecessary to add that these descriptions possess great excellence; the name of Bentham is a sufficient security on that point.

Such books as that now before us are the strongest proof of the value of the assistance of late afforded by Government for the publication of the results in natural science obtained by officers on board